

What is claimed is:

1. A compressor system comprising:

a variable displacement compressor apparatus, wherein the compressor apparatus includes:

a refrigerant inlet, through which refrigerant is suctioned into the compressor apparatus;

a refrigerant outlet, through which refrigerant is discharged from the compressor apparatus;

a piston, which is reciprocally driven upon rotation of the compressor apparatus to compress refrigerant supplied from the refrigerant inlet; and

a control pressure chamber, which is connected to the refrigerant inlet and the refrigerant outlet and receives refrigerant pressure from at least one of the refrigerant inlet and the refrigerant outlet, wherein the refrigerant pressure in the control pressure chamber regulates a stroke of the piston to regulate a displacement of the compressor apparatus;

a pressure regulating means for regulating the refrigerant pressure in the control pressure chamber; and

a control means for controlling the pressure regulating means, wherein when the compressor apparatus is operated at a maximum displacement for a predetermined time period, the control means controls the pressure regulating means to gradually change the refrigerant pressure in the control pressure chamber in a manner that gradually reduces the displacement of the compressor apparatus.

2. The compressor system according to claim 1, wherein:

the pressure regulating means is a control valve, which changes at least one of:

a degree of communication between the refrigerant inlet and the control pressure chamber; and

a degree of communication between the control pressure chamber and the refrigerant outlet; and

when the refrigerant pressure in the control pressure chamber is kept substantially equal to the refrigerant pressure at the refrigerant inlet for the predetermined time period to maximize the displacement of the compressor apparatus, the control means controls the control valve such that the refrigerant pressure in the control pressure chamber is gradually changed toward the refrigerant pressure at the refrigerant outlet to gradually reduce the displacement of the compressor apparatus.

3. The compressor system according to claim 2, wherein:

the refrigerant inlet is communicated with the control pressure chamber through a choke;

the control valve is positioned between the control pressure chamber and the refrigerant outlet and changes the degree of communication between the control pressure chamber and the refrigerant outlet; and

when the refrigerant pressure in the control pressure chamber is kept substantially equal to the refrigerant pressure

at the refrigerant inlet for the predetermined time period by closing the control valve, the control means gradually opens the control valve to gradually change the refrigerant pressure in the control pressure chamber toward the refrigerant pressure in the refrigerant outlet.

4. The compressor system according to claim 1, wherein:  
the control pressure chamber receives a tiltable swash plate, which is connected to the piston; and  
a tilt angle of the swash plate is regulated by the refrigerant pressure in the control pressure chamber to regulate the stroke of the piston.

5. The compressor system according to claim 1, wherein the predetermined time period is 60 minutes or longer.

6. The compressor system according to claim 1, wherein after elapse of the predetermined time period, the control means controls the pressure regulating means to perform the changing of the refrigerant pressure in the control pressure chamber at least three times.

7. The compressor system according to claim 1, wherein after elapse of the predetermined time period, the control means controls the pressure regulating means to cyclically perform the changing of the refrigerant pressure in the control pressure chamber in three cycles, and each cycle takes twelve seconds to

change the refrigerant pressure in the control pressure chamber.

8. A vehicle air conditioning system comprising:

at least one evaporator, which exchanges heat between depressurized refrigerant and air to be discharged into a passenger compartment of a vehicle; and

a compressor system that includes:

a variable displacement compressor apparatus, wherein the compressor apparatus includes:

a refrigerant inlet, through which refrigerant is suctioned into the compressor apparatus;

a refrigerant outlet, through which refrigerant is discharged from the compressor apparatus;

a piston, which is reciprocally driven upon rotation of the compressor apparatus to compress refrigerant supplied from the refrigerant inlet; and

a control pressure chamber, which is connected to the refrigerant inlet and the refrigerant outlet and receives refrigerant pressure from at least one of the refrigerant inlet and the refrigerant outlet, wherein the refrigerant pressure in the control pressure chamber regulates a stroke of the piston to regulate a displacement of the compressor apparatus;

a pressure regulating means for regulating the refrigerant pressure in the control pressure chamber; and

a control means for controlling the pressure regulating means, wherein when the compressor apparatus is operated at a maximum displacement for a predetermined time

period, the control means controls the pressure regulating means to gradually change the refrigerant pressure in the control pressure chamber in a manner that gradually reduces the displacement of the compressor apparatus.